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MORTALITY OF NUCLEAR SUBMARINERS IN THE U.S. NAVY. *G. Friedman-Jimenez, I. Kato, Y. Afanasyeva, and R. Shore (New York University School of Medicine, New York, NY 10016)

Men who served on nuclear powered submarines breathed recirculated air containing environmental tobacco smoke and low levels of a variety of other potentially harmful environmental agents. In a historical cohort mortality study, 85,033 men who served on nuclear powered submarines in the U.S. Navy between 1969 and 1982 were followed through 1995. Standardized Mortality Ratios (SMRs) were estimated using an external comparison group of U.S. males. Excess Relative Risks (ERR) per year of nuclear submarine duty (mean 3.8 years) were estimated without external comparisons, using linear Poisson regression models for selected causes of death. Mortality from all causes, all cancers, lung cancer, ischemic heart disease, and nonmalignant lung disease was of greatest a priori interest. SMRs, 95% Confidence Intervals, and observed deaths N are: all causes 70 (67–72), N=3,263; all cancers 87 (80–94), n = 584; lung cancer 93 (79–108), n = 159; ischemic heart disease 71 (64–79), n = 355; and nonmalignant lung disease 50 (38–64), n = 60. ERRs (per year nuclear submarine duty) and 95% Confidence Intervals are: all cancer 0.089 (.02-.19); lung cancer 0.045 (-.03, .20); ischemic heart disease 0.06 (.003, .15); and nonmalignant lung disease 0.055 (-.04, .34). For most causes of death, nuclear submariners have substantially reduced mortality rates compared with the U.S. general population, likely due to strong healthy worker effects. In within-cohort analyses, mortality rates from all cancer and ischemic heart disease show small positive linear trends with years of nuclear submarine duty that are not confounded by attained age, race, radiation exposure, calendar year, or time since first enlistment.

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ANALYSIS BEYOND PUBLICATION: FURTHER EVALUATION OF AN OCCUPATIONAL STUDY OF CHROMIUM WORKERS. D. Proctor, *M. Kelsh, E. Lau, A. Exuzides, and J. Cahill (Exponent, Menlo Park, CA 94025)

Numerous analytical choices and assumptions are required in an occupational epidemiologic study. Rarely are the impacts of these choices presented in published reports. In this analysis, we examined the effects on standardized mortality ratio (SMR) estimates of: 1) reference group selection, 2) exposure classification (selection of exposure cutpoints and evaluation of peak exposure), 3) inclusion of short-term workers and 4) control for smoking as a potential confounding variable. Data for these analyses were derived from the Gibb et al study of chromium workers (Gibb H.J. et al., 2000. Lung cancer among workers in chromium chemical production. Am J Ind Med 38: 115 – 126.) Using Baltimore as the reference population (facility location) reduced the SMR from 1.6 (Maryland as the reference group) to 1.2. Our dose-response analysis suggests that there may have been a cumulative exposure threshold dose for lung cancer at 0.8 mg CrO3/m3-years in this cohort. Over 50% of the cohort worked at the plant for less than 1 year, and only about 15% worked for 5 or more years. However, the inclusion of short-term workers did not change SMR results. Based on the original authors job exposure matrix classification, workers who were never exposed above the permissible exposure limit (PEL), the vast majority of the cohort, did not have a significantly increased lung cancer risk. However, workers who were exposed above the current PEL (100 μg CrO3/m3) had higher lung cancer SMRs. Three variations of smoking adjustment (using different assumptions about smoking prevalence) were evaluated and as expected, smoking-adjusted SMRs were lower than non-adjusted values. The use of Baltimore as the reference population, an expanded number of more homogeneous exposure groups and smoking-adjustment changed the shape of the dose-response curve, which has implications for establishing occupational exposure limits. These analyses demonstrate the value of continued data evaluation even after first publication.

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A RETROSPECTIVE COHORT STUDY OF GENERAL MORTALITY IN FLORIDA FIREFIGHTERS. *F Ma, LE Fleming, D Lee, and E Trapido (University of Miami School of Medicine, Miami, FL 33136)

To investigate whether exposure to occupational hazards among firefighters could lead to an increased risk of cancer, lung or heart diseases, age- and gender-adjusted mortality rates of fulltime firefighters were compared with the general Florida population in a standardized mortality study (SMR). Information was obtained from 35,777 male and 2,165 female Florida professional firefighters who were certified between 1972 and 1999. A total of 1,449 deaths among Florida firefighters (1,411 male and 38 female) were identified by linkage with Florida Vital Statistics. In male firefighters, mortality due to all causes, respiratory diseases, diseases of the circulatory system, and most other non-malignant diseases was significantly less than expected. There was no excess risk of overall mortality from cancer, but excesses of male breast cancer (standardized mortality ratio (SMR)=7.41; 95% confidence interval (CI) = 1.99, 18.96) and thyroid cancer (4.82; 1.30, 12.34) were found. Female firefighters had similar morality patterns to other Florida women for all diseases except atherosclerotic heart disease (3.85; 1.66, 7.58). These findings indicate that firefighters as a group were healthier than the general population and without significant occupational disease mortality. This work was funded in part by a grant from the National Institute of Occupational Safety and Health (NIOSH).

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OCCUPATIONAL RISK FACTORS FOR MENINGIOMAS AND ACOUSTIC NEUROMAS IN THE UNITED STATES. *P. Rajaraman, A. De Roos, P. Stewart, M. Linet, and P. Inskip (Division of Cancer Epidemiology and Genetics, NCI, NIH, DHHS, Bethesda, MD 20892)

Work-related exposures may be related to the development of brain tumors. This study examines occupation as a risk factor for meningioma and acoustic neuroma. Between the years 1994–8, 197 incident meningioma cases, 96 incident acoustic neuroma cases and 799 controls frequency-matched on hospital, age, sex, race, and proximity of residence to the hospital were accrued from three major hospitals in the United States. A detailed lifetime work history and information on known or suspected risk factors for brain tumors was obtained for all participants. Jobs with similar tasks and exposures were assigned to an occupational group. Logistic regression was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for each occupational group with five or more exposed individuals. The reference group comprised those individuals who never worked in that occupation. Models were adjusted for study matching factors and in the case of acoustic neuroma, for education as well. Preliminary analyses indicate an elevated risk of meningioma for individuals who had ever worked in the following occupational groups: auto body painters (OR = 6.4, 95% CI = 1.0, 40.2), designers and decorators (OR = 4.9, 95% CI = 1.0–22.7), military occupations (OR = 2.3, 95% CI = 1.0, 5.0), production managers and supervisors (OR = 3.6, 95% CI = 1.1, 11.6), and teachers and instructors (OR = 1.6, 95% CI = 1.0, 2.6). For acoustic neuroma, increased risk was noted for having ever worked in the following occupations: athletes and related occupations (OR = 12.1, 95% CI = 1.3, 111.2), sales representatives (OR = 1.9, 95% CI = 1.0, 3.5), and teachers and instructors (OR = 1.8, 95% CI = 1.0, 3.5). Although the results of this analysis are limited by the small number of cases and controls in some occupational groups, they could provide important clues to the etiology of these little-studied tumors.